REMARKS

This case has been carefully reviewed in light of the Office Action of 11/23/01, in which claims 1-8 were rejected under 35 USC 102(b) as being anticipated by Reinacher et al., U.S. Patent No. 3,622,310; claims 10-26 were rejected under 35 USC 103(a) as being unpatentable over Reinacher et al.; and claims 9 and 27-34 were rejected under 35 USC 103(a) as being unpatentable over Reinacher et al. in view of Selman et al., U.S. Patent No. 3,640,705. In this amendment, the abstract of the disclosure, the specification, and claims 1, 9-15, 20-21, 26-28, and 32-34 have been amended, and claims 5-8 and 16-19 have been cancelled. Reconsideration in light of the preceding amendment and the following remarks is respectfully requested.

Applicants respectfully traverse the rejection of claims 1-8 under 35 USC 102(b) as being anticipated by Reinacher et al. Reinacher et al. describe alloys of improved strength and high temperature resistance, wherein noble metals such as platinum group metals and gold are combined with small (0.1 to 5 percent) amounts of transition metals whose oxides exhibit high heats of formation, such as zirconium, hafnium, tantalum, and others. This reference describes a process wherein the alloy is heat-treated to oxidize the transition metal to form a dispersion of stable transition metal oxides which serves to increase the strength of the noble metal alloy. Applicants respectfully emphasize that this reference <u>requires</u> the presence of the transition metal in the alloy (e.g., note the non-zero composition range as found in column 2, lines 50-51), regardless of what noble metals are also present. Note that each of the six examples set forth in Reinacher et al. describe an alloy with 1% transition metal. Reinacher et al. describe several different noble metal elements that can be used in accordance with the described process, but regardless of what noble metal elements are present, the alloys of Reinacher et al. derive their strength from the oxidation of the ever-present oxide-forming element, preferably zirconium (col. 2, lines 45-51). In fact, this reference teaches away from noble metal alloys with no transition metal additions in col. 1, lines 6-8: "A disadvantage of platinum and its alloys with other noble metals is visible in their relatively poor strength at high temperatures." As a result of the requirement that an oxide-forming transition metal be present in the alloy, and its teaching away from noble metal alloys with no oxide-forming metal additions, Applicants respectfully submit that Reinacher et al. do not teach, suggest, or disclose "an alloy <u>consisting essentially of</u> rhodium, platinum, and palladium" as recited in amended claim 1 of the present application. The transition language "consisting essentially of" precludes the presence of zirconium and other oxide-forming elements in sufficient quantities to significantly affect the alloy properties, such as those quantities described by Reinacher et al. Applicants respectfully submit that claim 1 is therefore not anticipated by the applied reference. Furthermore, pending claims 2-4 depend from claim 1, and thus Applicants respectfully submit that each of these dependent claims is patentably distinct from the applied reference because each depends from a distinct independent claim.

Applicants respectfully traverse the rejection of claims 10-26 under 35 USC 103(a) as being unpatentable over Reinacher et al. The failure of this applied reference to teach, suggest, or disclose

(and in fact its clear teaching away from) alloys consisting essentially of platinum metal elements has been noted above. Claims 10-13 depend from claim 1, which Applicants believe to be patentably distinct from this reference, as set forth above, and thus Applicants respectfully submit that claims 10-13 are allowable due to their dependency on an allowable independent claim. Amended independent claims 14, 15, and 26 recite alloy compositions that consist essentially of platinum group metals, including, for example, platinum, palladium, rhodium, and, in some cases, ruthenium. As alloys of such compositions are not taught, suggested, or disclosed by the applied reference, Applicants respectfully submit that each of independent claims 14, 15, and 26 are patentably distinct from the applied reference. Furthermore, claims 20-22 depend from claim 15, and thus Applicants respectfully submit that each of these dependent claims is patentably distinct from the applied reference because each depends from a distinct independent claim.

Applicants respectfully traverse the rejection of claims 9 and 27-34 under 35 USC 103(a) as being unpatentable over Reinacher et al. in view of Selman et al. Claim 9 depends from claim 1, which Applicants believe to be allowable for the reasons described above, and thus Applicants respectfully submit that claim 9 is allowable due to its dependency from an allowable independent claim. Amended independent claims 27 and 32-34 recite turbine engine components comprising alloy compositions that consist essentially of platinum group metals, including, for example, platinum, palladium, rhodium, and, in some cases, ruthenium. The failure of Reinacher et al. to teach, suggest, or disclose (and in fact its clear teaching away from) alloys consisting essentially of platinum metal elements has been noted above. Selman et al. do not overcome this deficiency. This reference is, in fact, remarkably similar to Reinacher et al. in that Selman et al. teach away from platinum group metal alloys with no transition metal element additions due to low strength (col. 1, lines 15-17), and, like Reinacher et al., allege to have made the discovery of the extraordinary properties achieved through the use of platinum group metal alloys with "a minor amount of a solute base metal" when the alloy is "internally oxidized to produce a dispersion-hardened material" (col. 1, lines 37-42). The description of the alloys alleged to be the invention of Selman et al., like those of Reinacher et al., requires that the oxide-forming material be present in a non-zero amount (col. 2, lines 1-10). No fair reading of Selman et al. teaches, suggests, or discloses alloys consisting essentially of platinum group metals. Selman et al. relate that

> Platinum group metal alloys embodying, or when made by the method of, the invention will be found to possess considerably improved properties at ambient or high temperatures compared with existing platinum group metal alloys, particularly as regards mechanical strength and to be particularly suitable for use not only in the glass industry, as hereinbefore mentioned, but also for certain structural parts of jet engines...*(emphasis added)*

Clearly, alloys "embodying or when made by the invention" according to Selman et al. must have at least one oxide-forming element present. Therefore, Applicants respectfully submit that Selman et al. and its combination with Reinacher et al. do not teach, suggest, or disclose a gas turbine engine component comprising an alloy consisting essentially of platinum group metals, as recited in independent claims 27 and 32-34, and thus these claims are patentably distinct from the applied

references, whether singly or in combination. Furthermore, pending claims 28-31 depend from claim 27, and thus Applicants respectfully submit that each of these dependent claims is patentably distinct from the applied reference because each depends from a distinct independent claim.

In view of the foregoing, Applicants respectfully submit that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are respectfully requested.

Respectfully submitted,

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<u>Version with markings to show changes made</u>

Abstract

An alloy and a gas turbine engine component comprising an alloy, the alloy [comprising] <u>consisting essentially of</u> rhodium, platinum, and palladium, wherein the alloy comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

Paragraph beginning on page 2, line 15

The present invention provides several embodiments that address this need. One embodiment is an alloy [comprising] <u>consisting essentially of</u> rhodium, platinum, and palladium, wherein the alloy comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

Paragraph beginning on page 2, line 19

A second embodiment is an alloy [comprising] <u>consisting essentially of</u> from about 5 atomic percent to about 40 atomic percent platinum and the balance comprising rhodium, wherein the alloy further comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

Paragraph beginning on page 2, line 23

A third embodiment is a gas turbine engine component comprising an alloy, the alloy [comprising] <u>consisting essentially of</u> rhodium, platinum, and palladium, wherein the alloy of the gas turbine engine component comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

Claims

1. (Amended) An alloy [comprising] <u>consisting essentially of</u> rhodium, platinum, and palladium, wherein said alloy comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

9. (Amended) The alloy of claim [8] <u>1</u>, wherein said alloy is disposed in a gas turbine engine.

10. (Amended) The alloy of claim [8] <u>1</u>, wherein:

said palladium is present in an amount ranging from about 1 atomic percent to about 41 atomic percent;

said platinum is present in an amount that is dependent upon said amount of palladium, such that

a. for said amount of palladium ranging from about 1 atomic percent to about 14 atomic percent, said platinum is present up to about an amount defined by the formula (40 + X) atomic percent, wherein X is the amount in atomic percent of said palladium, and

b. for said amount of palladium ranging from about 15 atomic percent up to about 41 atomic percent, said platinum is present in an amount up to about 54 atomic percent; and

the balance [comprising] <u>consists essentially of</u> rhodium, wherein said rhodium is present in an amount of at least 24 atomic percent.

11. (Amended) The alloy of claim 10, wherein:

said platinum is present up to the lesser of about 52 atomic percent and an amount defined by the formula (30+X) atomic percent, wherein X is the amount of said palladium;

said palladium is present in an amount that is dependent on the amount of said platinum, such that

a. for said amount of platinum ranging from about 0 to about 21 atomic percent, said palladium is present in an amount ranging from about 1 atomic percent to about an amount defined by the formula (15+Y) atomic percent, wherein Y is the amount in atomic percent of said platinum, and

b. for said amount of platinum ranging from about 22 atomic percent to about 52 atomic percent, said palladium is present in an amount ranging from about 1 atomic percent to about 36 atomic percent; and

the balance [comprising] <u>consists essentially of</u> rhodium, wherein said rhodium is present in an amount ranging from about 26 atomic percent to the lesser of about 95 atomic percent and about an amount defined by the formula (85+2Y) atomic percent, wherein Y is the amount in atomic percent of said platinum.

12. (Amended) The alloy of claim 11, said alloy [comprising] <u>consisting essentially of</u>:

from about 21 atomic percent platinum to about 52 atomic percent platinum;

from about 22 atomic percent palladium to about 36 atomic percent palladium; and

the balance [comprising] <u>consisting essentially of</u> rhodium, wherein said rhodium is present in an amount ranging from about 26 atomic percent rhodium to about 43 percent rhodium.

13. (Amended) The alloy of claim 11, said alloy [comprising] <u>consisting essentially of</u>:

from about 3 atomic percent platinum to about 29 atomic percent platinum;

from about 1 atomic percent palladium to about 6 atomic percent palladium; and

the balance [comprising] <u>consisting essentially of</u> rhodium, wherein said rhodium is present in an amount ranging from about 70 atomic percent to the lesser of about 94 atomic percent and about an amount defined by the formula (85+2Y) atomic percent, wherein Y is the amount in atomic percent of the platinum.

14. (Amended) An alloy consisting essentially of:

palladium, in an amount ranging from about 1 atomic percent to about 41 atomic percent;

platinum, in an amount that is dependent upon said amount of palladium, such that

a. for said amount of palladium ranging from about 1 atomic percent to about 14 atomic percent, said platinum is present up to about an amount defined by the formula (40 + X) atomic percent, wherein X is the amount in atomic percent of said palladium, and

b. for said amount of palladium ranging from about 15 atomic percent up to about 41 atomic percent, said platinum is present in an amount up to about 54 atomic percent;

[from about 0 atomic percent to about 5 atomic percent of a metal selected from the group consisting of zirconium, hafnium, titanium, and mixtures thereof;]

from about 0 atomic percent to about 5 atomic percent ruthenium; and

the balance rhodium, wherein said rhodium is present in an amount of at least 24 atomic percent;

wherein said alloy [further] comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

15. (Amended) An alloy [comprising]consisting essentially of:

from about 5 atomic percent to about 40 atomic percent platinum; and

the balance [comprising]consisting essentially of rhodium;

wherein said alloy [further] comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

20. (Amended) The alloy of claim [19]15, [comprising]consisting essentially of:

from about 5 atomic percent to about 30 atomic percent platinum; and

the balance [comprising]consisting essentially of rhodium.

21. (Amended) The alloy of claim 20, [comprising]consisting essentially of:

from about 5 atomic percent to about 10 atomic percent platinum; and

the balance [comprising]consisting essentially of rhodium.

26. (Amended) An alloy consisting essentially of:

from about 5 atomic percent to about 40 atomic percent platinum;

[from about 0 atomic percent to about 5 atomic percent of a metal selected from the group consisting of zirconium, hafnium, titanium, and mixtures thereof;]

from about 0 atomic percent to about 5 atomic percent ruthenium; and

the balance rhodium;

wherein said alloy comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

27. (Amended) A gas turbine engine component comprising an alloy, said alloy[comprising] consisting essentially of: rhodium, platinum, and palladium;

wherein said alloy of said gas turbine engine component comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

28. (Amended) The gas turbine engine component of claim 27, wherein said alloy [comprises] consists essentially of:

palladium, in an amount ranging from about 1 atomic percent to about 41 atomic percent;

platinum, in an amount that is dependent upon said amount of palladium, such that

a. for said amount of palladium ranging from about 1 atomic percent to about 14 atomic percent, said platinum is present up to about an amount defined by the formula (40 + X) atomic percent, wherein X is the amount in atomic percent of said palladium, and

b. for said amount of palladium ranging from about 15 atomic percent up to about 41 atomic percent, said platinum is present in an amount up to about 54 atomic percent;

[from about 0 atomic percent to about 5 atomic percent of a metal selected from the group consisting of zirconium, hafnium, titanium, and mixtures thereof;]

from about 0 atomic percent to about 5 atomic percent ruthenium; and

the balance [comprises] consists essentially of rhodium, wherein said rhodium is present in an amount of at least 24 atomic percent;

wherein said alloy of said gas turbine engine component [further] comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

32. (Amended) A turbine engine airfoil comprising an alloy, said alloy [comprising]consisting essentially of:

from about 21 atomic percent to about 52 atomic percent platinum;

from about 22 atomic percent to about 36 atomic percent palladium; and

the balance [comprises] consists essentially of rhodium, wherein said rhodium is present in an amount ranging from about 26 atomic percent to about 43 percent rhodium;

wherein said alloy of said turbine engine airfoil comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

33. (Amended) A turbine engine airfoil comprising an alloy, said alloy [comprising]consisting essentially of:

from about 3 atomic percent to about 29 atomic percent platinum;

from about 1 atomic percent to about 6 atomic percent palladium; and

the balance comprising rhodium, wherein said rhodium is present in an amount ranging from about 70 atomic percent to about 94 atomic percent and about an amount defined by the formula (85+2Y) atomic percent, wherein Y is the amount in atomic percent of the platinum;

wherein said alloy of said turbine engine airfoil comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.

34. (Amended) A turbine engine airfoil comprising an alloy, said alloy [comprising]<u>consisting essentially of</u>:

from about 5 atomic percent to about 40 atomic percent platinum;

[from about 0 atomic percent to about 5 atomic percent of a metal selected from the group consisting of zirconium, hafnium, titanium, and mixtures thereof;]

from about 0 atomic percent to about 5 atomic percent ruthenium; and

the balance comprising rhodium;

wherein said alloy of said turbine engine airfoil comprises a microstructure that is essentially free of L12 – structured phase at a temperature greater than about 1000°C.